induced foci which was in accordance with the progression of DNA repair and the declining dose rates. The absorbed dose in most patients treated with ^{131}I exceeded 20mGy in the first hour, and in these patients, the on-set of a fast repair component was observed.
Conclusions: With the experimental results and model calculations presented in this work, for the first time a dose-response relationship and a description of the time course of the in-vitro and in-vivo damage response after internal irradiation of β^--emitters could be established.

Keywords: gamma-H2AX and 53BP1, radionuclide therapy, dosimetry

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A quantitative assessment of intra-fractional tumor motion and deformation error on planned dose at conventional proton therapy

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Purpose: In proton therapy, two major beam delivery techniques are used which are referenced as active and passive delivery strategies. In latter case, an effective dose distribution into tumor volume is created by pencil beam extracted from the accelerator exit window. To do this aim, the modulation is performed to produce two uniform beam profiles: 1) along with beam trajectory and 2) in lateral direction vertical to beam direction. The first dose profile cover tumor volume in target depth against beam direction and the second lateral profile include tumor volume, transversely. Several passive devices are utilized to create depth dose profile known as Spread-Out Bragg Peak (SOBP) and transverse dose profiles. In proton therapy, the final purpose is to produce a three dimensional (3D) homogeneous dose distribution onto the tumor volume while minimizing the dose to the surrounding healthy tissues around the tumor. Relating to moving and deforming targets, the delivery dose is not matched with the planned dose.
Methods: Our goal in this work is to obtain a quantitative assessment of three dimensional dose distribution on the moving and deforming targets and surrounding normal tissues affected by the breathing motion. For this aim, a simulation study was performed using Monte Carlo FLUKA code. The effect of each of the parameters in a clinical passive beam scanning system on radiotherapy dosage was considered. The dose deposition from protons was simulated for fields designed for the treatment of dynamic, deformed and static tumors.
Results: Dose distribution results of Monte Carlo method simulation were compared with the results obtained during experimental process at Cyclotron and Radioisotope Center (CYRIC) in Tohoku University. Final analyzed results represent that the uniformity of dose distribution on all given tumors are up to 95% of uniformity that proves a successful dose delivery onto tumor as well according to planned dose. The results of dose distribution into tumor and surrounding healthy tissues around the tumor for static spherical case regarding with deformed tumors and moving tumors were obtained. Conclusion: In conventional proton therapy a significant dose is delivered to the normal tissues in comparison with stationary condition without getting any strategy to limit ITV region such as motion gated or real-time tumor tracking strategies. The accuracy of dose distribution increasing with decreasing magnitude of deformation, moving and stretching of the tumor.

Keywords: Proton therapy, Radiotherapy Dosage, Monte Carlo Method.

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A compact high current accelerator for radioisotope production

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An initial design of a compact, high current Fixed Field Alternating Gradient accelerator has been made for the direct production of ^{99m}Tc and the production of a number of therapeutic isotopes that currently available only in limited quantities or not at all. These studies indicate that the FFAG could in principle accelerate a proton beam of up to 20mA to at least 30 MeV and high current alpha beams to a similar energy. This presentation will describe the FFAG and show what radioisotope yields should be possible. It will also outline the next steps in the project. It should be noted that the same basic FFAG design is being extended to the energies required for cancer therapy with light ion beams.

Keywords: FFAG; high beam current; radioisotope production; ^{99m}Tc; therapeutic isotopes

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